Range-wide Status Assessment of *Cirsium longistylum* (long-styled thistle)

Prepared for:

Burnett Land, LLC

By:

Scott Mincemoyer

Montana Natural Heritage Program
Natural Resource Information System
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EXECUTIVE SUMMARY

Cirsium longistylum Moore & Frankton (long-styled thistle) is a state endemic thistle restricted to areas of central Montana in and around the Little Belts, Big Belts and Castle mountains, generally on sedimentary parent materials. First described as a distinct species in 1963, its overall distribution and abundance remained poorly documented for a couple decades afterwards. It is currently known from a six county area. The majority of the populations occur on National Forest lands managed by the Helena and Lewis and Clark National Forests, though a few populations occur partially or wholly on private lands.

Field surveys were initiated in 2004 to update occurrence and population data for the species. These surveys discovered several new populations, extended the boundaries of several others, failed to relocate a few occurrences and provided updated and more precise population estimates for most of the known occurrences. Additional data and field observations were collected that enabled us to clarify potential threats such as those posed by invasive weeds and an introduced bio-control *Rhinocyllus conicus*.

Population estimates of nearly 30,000 plants, including seven high quality populations, scattered over four mountain ranges are promising for the long-term viability of the species. Long- and short-term population trends are difficult to gauge due to the lack of good survey data over many years. However, available data and observations provide some evidence that population levels have at least remained fairly stable over the past decade, with significant yearly fluctuations possible. Threats posed by invasive weeds and the introduced bio-control provide reason for concern and population monitoring should continue in the future. As a result of this assessment, the Montana Natural Heritage Program ranking of the species will change from the current G2/S2 to G3/S3 (see Appendix A: Global/State Rank Definitions).

ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

Cirsium longistylum Moore & Frankton (long-styled thistle) is a state endemic thistle restricted to areas of central Montana in and around the Little Belts, Big Belts and Castle mountains, generally on sedimentary parent materials. First described as a new species in 1963 by Moore and Frankton, its overall distribution and abundance remained poorly documented for a couple decades afterwards. Starting in the 1980's the U.S. Forest Service and the Montana Natural Heritage Program (MTNHP) began to document populations of the thistle, primarily in the Little Belt Mountains. Surveys from the 1980's to 2001 substantially increased the knowledge of the distribution and abundance of the species. During this time, the documented range was extended into the Big Belts and Castle Mountains and in 2003 it was documented in the Dry Range between the Little Belts and Big Belts.

In 1990 the U.S. Fish and Wildlife Service included the species in its listing of candidate species for federal protection under the Endangered Species Act (U.S. Department of Interior 1990). After review it was determined that the species did not warrant protection under the Act. However, threats to the species from several sources and its limited distribution did raise concern about the species' long-term viability and it continued to be tracked in the state by the MTNHP. MTNHP has maintained and collected occurrence and population data on the species for several decades.

The purpose of this assessment is to collect updated survey data on the range-wide distribution and abundance of the species, identify threats, assess trends and review and update the species ranking in the state as appropriate.

II. Species Information

A. Classification

1. Scientific Name: *Cirsium longistylum* Moore & Frankton

2. Common Name: long-styled thistle, longstyle thistle

3. Family: Asteraceae (aster or sunflower family); in the tribe Cardueae

4. Type Description and Specimens Cited:
Moore, R.J. and C. Frankton. 1963. Cytotaxonomic notes on some *Cirsium* species of the western United States. Canadian Journal of Botany. 41:1553-1567.

Senn, Frankton & Gillett 5666, Aug. 23, 1951. Montana, Cascade Co., Little Belt Mountains, 3 miles SE of Monarch (Holotype: DAO)
Senn, Frankton & Gillett 5670, Aug. 23, 1951. Montana, Meagher Co., Kings Hill, 8000 ft. (DAO)
Senn 6207, Jul. 29, 1953. Montana, Meagher Co., Little Belt Mountains, 20 miles south of Neihart, Forest Green Resort, 5600 ft. (DAO)
Flodman 880, Aug. 19, 1896. Montana, Long Baldy, Little Belt Mountains. (NY)

Herbarium reference codes are from Holmgren and Holmgren (1990).

5. Size of Genus: *Cirsium* is a diverse genus with 13 species in Montana (Dorn 1984, USDA NRCS 2004), approximately 101 species in the United States (USDA NRCS 2004) and approximately 350 species worldwide (Moore and Frankton 1974).

B. Present Legal or Other Formal Status

1. National

a. Legal Status: The species was considered for protection under the Endangered Species Act (U.S. Department of Interior 1990) in the early 1990's but was dropped from consideration after additional survey data showed that it did not warrant protection under the Act.

2. State

a. Montana

i. Legal Status: None.

ii. Heritage Rank: The current (prior to this status assessment) state rank is S2, indicating that it is at high risk due to potentially declining population numbers and/or habitat, making it vulnerable to extinction or extirpation in the state.

C. Description

1. General Non-technical Description: Long-styled thistle has simple or branched stems that are 50-60 cm tall and up to 15 mm thick at the base; plants are perennial, producing daughter rosettes that live for two more years. The basal leaves are shallowly lobed, moderately spiny, green and glabrous above, and densely white-hairy below; the lower leaves are narrowly lance-shaped, up to 15 cm long, and lobed to 1/3 or less the leaf width. The smaller upper leaves are more ovate in outline with mostly entire margins and numerous marginal spines; the herbage is covered with long, tangled, white hairs. The inflorescence usually consists of a terminal cluster of 2 to several flower heads and a number of side branches that reach up to 15 cm long and have fewer heads; each flower head is about 30 mm high, 25 mm wide, and subtended by a few reduced leaves. The involucral bracts occur in two main series: the outer are narrowly lance-shaped with a yellowish, dilated, and fringed apex tipped by a slender spine; the inner bracts are more lance-shaped and longer. The white disk flowers are 20-22 mm long; ray flowers are absent. There are numerous tawny bristles, which form a pappus at the tip of the achene.

2. Technical Description: Plants 50-60 cm high, stems thick, to 1.5 cm diameter at the base, ribbed, lightly arachnoid pubescent with long, multicellular hairs; perennial with biennial to perennial offsets.

Leaves linear-lanceolate, base not decurrent, length about 10 times the width, to 15 cm long, 1.5 cm wide, lobed to 1/3 width, or less, the smaller upper leaves essentially entire, lobes ovate, often irregular with numerous fine marginal spines to 5 mm long. Leaves gray-green, lightly arachnoid above, white, villous below. Flower heads 3 cm high, 2.5 cm wide. Arrangement of heads variable and not exclusively in a close terminal cluster, but also borne one or two at the apex of the stem and on lateral branches. Plants usually bearing many floriferous branches to 15 cm long on the terminal third of the stem. Heads are subtended by a few reduced leaves, the uppermost about the same size as the involucral bracts with gray multi-cellular hairs at right angles to the margin. Involucre 2 cm high, composed of five to six rows of phyllaries. Outer phyllaries linear-lanceolate, base 1.5-2 mm broad, weakly glandular or with a dark blotch, surface glabrous, apical portion slightly dilated with a yellow lacerate fringe, tipped by a slender 2 mm spine. Middle phyllaries similar but progressively less dilated-lacerate. Inner phyllaries longer, lanceolate, tip not or only slightly dilated and lacerate. Flowers white, corolla 20-22 mm long, tube 7-9 mm, lobes 3.5-5.5 mm, pappus 18-19 mm, tawny with 30-40 setae, longer setae clavellate; anthers, including appendages 7.5-8.5 mm long, free anther tips usually incurved; pollen 44-51 µ in outer diameter; style long exserted to 1 cm beyond the corolla, tip to joint of style 3.5-5 mm. Achenes 5.5-6.5 mm x 2 mm, light brown, sometimes with purplish flecks. Rosette leaves moderately spiny, the margins with broad, shallow divisions, green and glabrous above, densely white pubescent below (Moore and Frankton 1963).

Figure 1. *Cirsium longistylum* flower head. Note the widened and fringed involucral bracts.

Figure 2. Putative hybrid between *C. longistylum* and *C. hookerianum* in the Dry Range. Note the slightly widened involucral bracts.

3. Similar Species: *Cirsium hookerianum* and *C. scariosum* are both similar to *C. longistylum* in terms of their overall morphology and biology. In addition, the geographic distribution and habitats of the species overlap. *C. hookerianum* can be distinguished by its long-tapering involucral bracts that are not fringed and dilated near the apex. Specimens of *C. scariosum* may be confused with

Figure 3. *Cirsium hookerianum* flower head. Note the long-tapering involucral bracts.

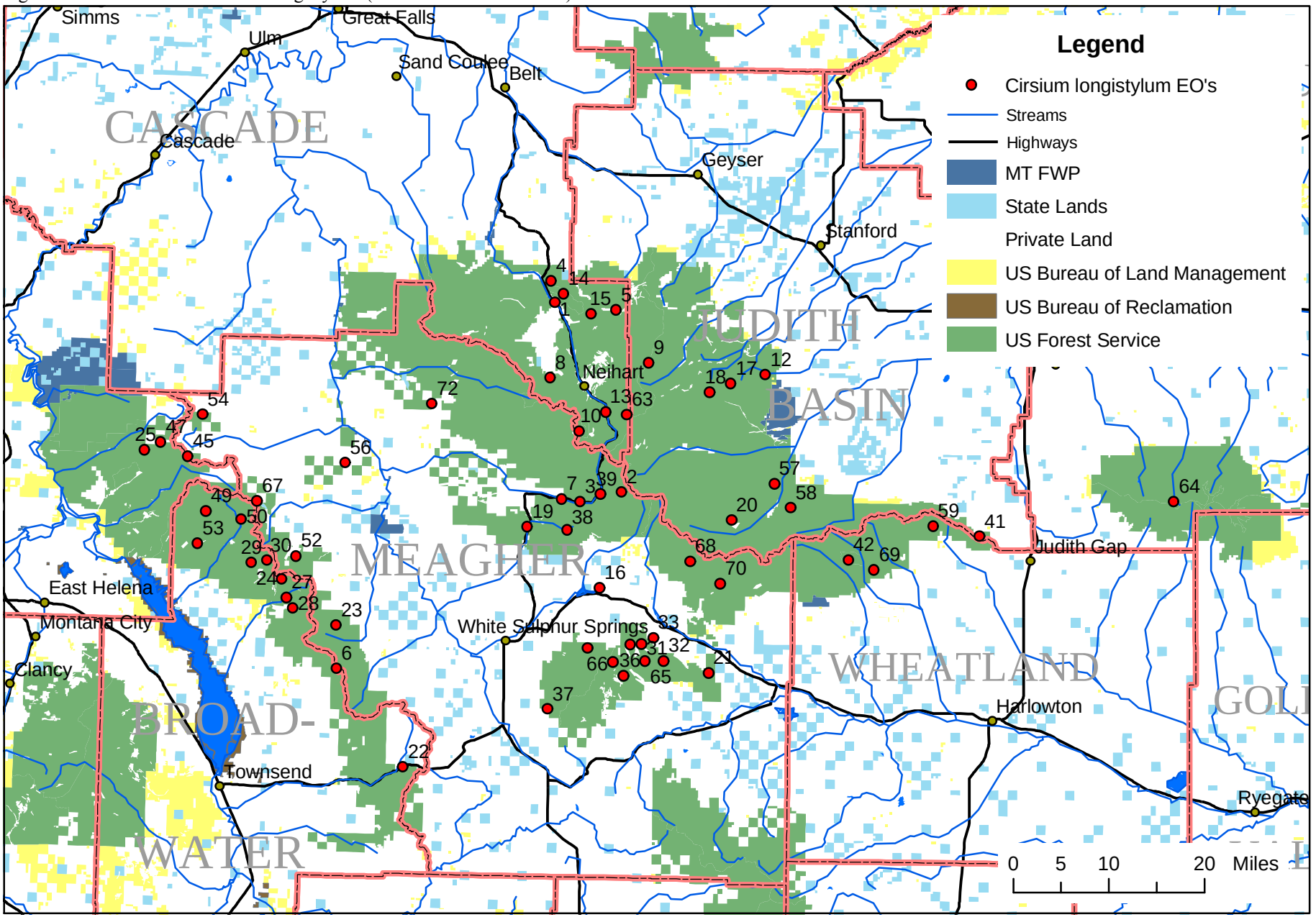
C. longistylum in that the inner involucral bracts are sometimes fringed and dilated at the apex. However, the outer involucral bracts always taper to the tip without a fringed or dilated section. In fact, the reported occurrence of *C. longistylum* in the Elkhorn Mountains (Poole and Heidel 1993) was apparently based on specimens of *C. scariosum* with apically fringed and dilated inner involucral bracts intermixed with *C. hookerianum* (Mincemoyer 2004). Confusion among the taxa arises due to apparent hybridization and introgression among the species which results in intermediate bract characteristics. Currently, identification of rosettes and vegetative specimens based on morphological characters alone cannot be reliably determined.

4. Phylogenetic Relationships: *Cirsium longistylum* is closely related to other members of the genus, such as *C. hookerianum* and *C. scariosum*. Chromosome counts of the 3 species are all 2n=34 (Mathews 1980, Moore and Frankton 1963, Ownbey and Hsi 1963, Gardner 1974). Results of a genetic analysis by Brunsfeld and Baldwin (1994) provided additional evidence that *C. longistylum* is a distinct species and actually appears to be the most genetically distinct of the 3 species studied in west-central Montana. However, *C. longistylum* appears to commonly hybridize with the former and probably the latter as well. Based on bract morphology, putative hybrids with *C. hookerianum* appear to be common in areas where the two species are in close proximity, though enzyme electrophoresis found that the putative hybrids were most closely related to "pure" *C. longistylum* (Brunsfeld and Baldwin 1994). Also of interest is the fact that samples of *C. hookerianum* and *C. scariosum* taken from outside Montana were genetically distant from samples of the same species taken from within the state, based on an analysis of randomly amplified polymorphic DNA (RAPD) (Brunsfeld and Baldwin 1994). This suggests that introgression among the species may have historically occurred in the region and that gene flow among the species is likely still taking place.

D. Geographic Distribution

1. Range: *C. longistylum* is a state endemic thistle restricted to areas of central Montana in and around the Little Belts, Big Belts and Castle mountains, generally on sedimentary parent materials. Currently, the known distribution of the species is centered in the Little Belt Mountains, with additional populations in the Big Belts, Castle Mountains and the Dry Range. Populations also occur in the valley between the Little Belts and the Castle Mountains. The first known collection of the species was by Flodman in 1896 in the Little Belt Mountains. However, the plant was not formally described and recognized as a new species until 1963 (Moore and Frankton 1963) so the species went largely un-noticed for another 70 years after its first known collection. The species was known only from the Little Belts until 1976 when it was collected in the Big Belts by Robert Dorn (specimen deposited at MONT), though further surveys in the Big Belts did not take place until 1983. Its range was further extended into the Castle Mountains with a collection by Dana Field in 1991 and subsequent field surveys in 1992. Finally, in 2003 it was documented in the Dry Range between the Big Belts and the Little Belts (Olsen 2003). This brings the current known range to six counties, not including a historical collection from the Big Snowies.

Figure 4. Occurrences of Cirsium longistylum (Extant and Historic EO's)



2. Historical Populations: A survey of the Montana State University Herbarium (MONT) in 2004 located one specimen from the Big Snowy Mountains:

Booth 60121. July 19, 1960. Fergus Co., Snowy Mtns., about 20 miles south of Lewistown.

This specimen appears to be "pure" *C. longistylum* or a putative hybrid leaning towards *C. longistylum*. Limited surveys in the Big Snowy Mountains in August and September of 2004 could not relocate this population or any *C. longistylum* in the area. Unfortunately, the label information with this specimen is vague in regards to the collection locality and population size. The only native thistle species observed in the range was *C. eatonii* (Gray) Robins., which was locally abundant from lower elevation dry streambeds to the crest of the range. The geology and habitats found in the Big Snowies appear suitable for supporting populations of *C. longistylum* and additional future surveys may document the species in the area.

Data for five additional historical occurrences or populations that could not be relocated in 2004 are also maintained by the Montana Natural Heritage Program. These occurrences are described in Table 1.

Past reports of the species from the Elkhorn Mountains (Poole and Heidel 1993) appear to be in error and were based on mis-identification of *C. scariosum*. Field surveys to the site in 2004 by Mincemoyer were unable to locate any *C. longistylum* in the area, however the site does support a large population of *C. hookerianum* with minor amounts of *C. scariosum*. This is actually supported by the data collected in 1992 that states "Only 1 plant, in fruit, with *C. longistylum* characters was observed among a population of approximately 100 plants of *C. hookerianum* and possible hybrids and backcrosses." The specimens of *C. scariosum* examined at the site generally have inner involucral bracts dilated and fringed at the apex with outer bracts tapered to the tip. This probably led to the confusion in the identification of the species. In addition, the parent material of the site is generally granitics, while *C. longistylum* is typically found on calcareous substrates.

3. Additional Survey Areas: Mapping of suitable habitat for *C. longistylum* using ArcGIS and layers of geology, soils and precipitation was done to identify potential survey areas for 2004. Preliminary mapping identified several suitable areas in the Big Snowies, Elkhorns and Judith mountains, in addition to the mountain ranges already known to support populations of *C. longistylum*. Field surveys to several of the areas in the Elkhorn Mountains with potential suitable habitat failed to find any *C. longistylum*. However, the native thistles *C. hookerianum* and *C. scariosum* were encountered. Limited surveys in the Judith Mountains also failed to locate any *C. longistylum*. Other areas that have been surveyed in past years without any success include the Highwood Mountains and areas near Homestake Pass west of Helena.

4. Extant Sites: Occurrences of *C. longistylum* are summarized in Table 1 and Figure 4. Detailed occurrence maps are provided in Appendix C. The seven largest and highest quality (A or AB ranked) populations are described in further detail below.

The Kings Hill (EO #2) site was first observed in 1951, though details of the population were not documented until 1986. This is the largest known occurrence with 2004 surveys estimating the population at 9500+ individuals. This population extends across approximately 2000 acres on elevations of 6400-8100 feet. Populations extend from Kings Hill Pass and Showdown Ski area east and southeast to the Spur Park and Ant Park areas and south along portions of Deadman Creek. Habitats include subalpine and montane meadows, open subalpine forests and roadsides. In the Ant Park area, the thistle responded positively to a previous fire with many flowering individuals visible from the road in 2004. Very few weeds are currently present in this population though minor amounts of *Cirsium arvense* (Canada thistle), *Cynoglossum officinale* (houndstongue) and *Phleum pratense* (common timothy) were noted in 2004. Dominant vegetation is variable across the

area but includes species such as *Festuca idahoensis* (Idaho fescue), *Potentilla fruticosa* (shrubby cinquefoil), *Danthonia intermedia* (intermediate oatgrass), *Stipa nelsonii* (Nelson's needlegrass) and *Potentilla gracilis* (slender cinquefoil). Small numbers of *C. hookerianum* and putative hybrids were noted in the area, though overall this population appears to be mostly "pure" *C. longistylum*. A large population of *C. hookerianum* occurs several miles to the west in the Moose Park and O'Brien Park areas and it seems likely that gene flow between these two populations is occurring.

The Duck Creek Pass (EO #6) site in the Big Belt Mountains was estimated at 1200 plants during a 2004 survey. Previous estimates of population size were imprecise, with a 1992 survey placing the population between 1000-5000 individuals. The population covers approximately 200 acres and extends from near Gypsy Lake to approximately 2 miles west of Duck Creek Pass with the largest concentration of plants near the pass. The best and most intact habitat for the species occurs in the subalpine and montane meadows near the pass and immediately to the west. Several non-native species are present at the site, particularly at lower elevations. *Phleum pratense* is abundant while *Agrostis stolonifera* (bentgrass) and *Bromus inermis* (smooth brome) are locally common. Also present in the area are *Cirsium arvense, Cirsium vulgare* (bull thistle) and *Carduus nutans* (musk thistle). In spite of the threats posed by non-native species at the site, this is the most intact population within the Big Belt Mountains.

The Russian Flat (EO #20) site is the second largest population in the Little Belt Mountains with an estimate of 2000 individuals in 2004 over an area of about 700 acres. This population was first observed in 1990 with survey information noting "thousands of plants" in the area. Plants are concentrated in the meadows of Russian Flat, along Russian Creek and in meadows west of Russian Creek and south of Forest Service Road 487. However, individual plants are scattered along the road from approximately 2 miles east of Russian Flat to Hoover Spring along the South Fork Judith River about 6 miles west of Russian Flat. Though native vegetation dominates the area, several non-native species occur throughout the area, including *Phleum pratense, Cirsium vulgare, Bromus inermis, Cynoglossum officinale* and *Carduus nutans*.

The Atlanta Creek (EO #23) population occurs in the central Big Belts with an estimated population of 1000 individuals in 2004. The population occurs along Atlanta Creek and the open ridge to the north in section 6 at elevations of 6400-7400 feet. This area was first surveyed in 1992 and the population was documented at 250-400 plants over a 40 acre area. Of the 7 largest populations described here in detail this one may have the highest population density of *C. longistylum*. Putative hybrids occur at the site, though only account for approximately 15% of the *Cirsium* plants in the area. The site is dominated by native vegetation with small amounts of *Bromus inermis* and *Phleum pratense.*

The Dry Range (EO #56) population is a new site first documented in 2003 in montane meadows and open forests from 5000-6200 feet elevation. The site is approximately 20 miles northwest of White Sulphur Springs and occurs on a mix of private and National Forest lands. Surveys in 2004 estimated the population at approximately 2200 plants, along with numerous putative hybrids with *Cirsium hookerianum.* Density of *C. longistylum* tends to be highest near the crest of the range and on upper, south-facing slopes and declines quickly with decreasing elevation. The 2004 survey mapped occupied areas totaling approximately 790 acres. The 2003 estimate of 10,000 plants was too high due to inclusion of unsuitable habitat and putative hybrids. This population occurs in high quality montane meadows dominated by *Stipa richardsonii*, (Richardson's needlegrass) *Festuca scabrella* (rough fescue) and *Festuca idahoensis* with a diverse and abundant forb component. Several non-native species occur throughout the survey area with *Bromus inermis* and *Phleum pratense* being locally abundant in several disturbed meadows. The introduced bio-control agent *Rhinocyllus conicus* was observed in approximately 80% of the flower heads that were examined, with significant reductions in mature seeds. However, later developing flower heads

were largely uninfested since their development did not coincide with of the development of the weevil.

The East Fork Checkerboard Creek (EO #36) site is the largest documented population in the Castle Mountains with an estimated 1200 plants. *C. longistylum* was first observed in the area in 1992. The currently documented population extends from the headwaters of the East Fork Checkerboard Creek along FS Road 211, southeast along the South Fork Bonanza Creek and FS Road 581, north along Limestone Ridge and to the east along FS Road 585. Occupied habitats include riparian grasslands, montane meadows and several miles of roadsides at elevations of 6500-7000 feet. The area occupied by this population is approximately 80 acres. Species composition varies across the population, though dominants include *Festuca idahoensis*, *Poa pratensis* and *Koeleria macrantha* (prairie junegrass). Non-natives in the area include *Cirsium arvense, Cynoglossum officinale, and Bromus inermis.*

The Forest Service Road 274 (EO #68) population is a new occurrence documented in 2004. It occurs in the Little Belt Mountains and extends from Elephant Rock north for approximately 7 miles. Another significant subpopulation occurs in Bear Park about 3 miles north-northeast of Elephant Rock. Surveys in 2004 documented a population between 1000-1200 plants covering an area of almost 250 acres. The majority of the population occurs adjacent to roads, though significant numbers of plants occur in montane meadows dominated by *Festuca scabrella*, *Festuca idahoensis*, *Koeleria macrantha*, *Geranium viscosissimum* (sticky geranium), *Artemisia tridentata* (big sagebrush) and *Potentilla gracilis*. Exotic species associated with this occurrence include *Bromus inermis*, *Cirsium arvense* and *Phleum pratense*.

Table 1. Element Occurrence Records for *Cirsium longistylum*. See Appendix B for a description of the ranking codes.

EO #	County	Survey Site	Survey Data	Description	Ranking
01	Cascade	**Monarch SE.** Approximately 3 miles SE of Monarch.	No population data. Type locality, collected in 1951. Last observation in 1983.	4820-4920 ft.	H
02	Cascade, Meagher, Judith Basin	**Kings Hill.** Little Belt Mountains, King's Hill Pass and Showdown Ski area east and southeast to the Spur Park and Ant Park areas and south along portions of Deadman Creek.	2004: 3 large subpops. surveyed: with approx 9,500 plants. 1992: About 2200 plants in 2 surveyed subpops., concentrated around Kings Hill. None in campground, few along road or in ski area. 1990: Extended population boundaries, tens of thousands of plants. 1986: Frequent.	6400-8100 ft. Roadsides, meadows.	A
03	Meagher	**Forest Green.** About 16 miles south of Neihart.	1992 survey estimated 100 *Cirsium* plants with <10% showing characteristics of *C. longistylum*. First observation in 1953.	6030-6040 ft. Meadow.	C
04	Cascade	**Monarch.** Approximately 1 mile east of Hwy. 89 on Dry Fork Road (#120).	2004: 0 plants. 1992: 0 plants.1986: 2 plants observed.	4822 ft. Roadsides, disturbed grasslands.	F
05	Cascade	**Bender Creek Trail.** Little Belt Mountains, 9.7 miles east of Monarch on FS Road #120 (Dry Fork Belt Creek Road); population is at junction of road with trail #318 (Bender Creek Trail).	2004: Resurvey of the site found no *C. longistylum*. *C. hookerianum* and hybrids present. 1994: >100 flowering plants & rosettes. 1992: 23 plants, 18 flowering, 3 of which were *C. longistylum*. 1990: 10 plants counted. 1986: 20 plants; evidence of possible hybridization with *C. hookerianum.*	4680-5360 ft. Meadows, roadsides, riparian areas, disturbed sites.	F

Table 1. Continued.

EO #	County	Survey Site	Survey Data	Description	Ranking
06	Broadwater, Meagher	**Duck Creek Pass.** Big Belt Mountains, Duck Creek Pass Road #139, beginning just west of turnoff to Thompson Gulch guard station and Gipsy Lake area, and scattered along road to area west of Duck Creek Pass.	2004: 1200 plants. Hybrids with *C. hookerianum* appear common especially the further one goes from the pass. Previous population estimates are vague. 2001: Common in area. 1992: 1000-5000 individuals, all in flower. 1983: Some subpopulations have >100 plants; another thistle, possibly *C. hookerianum*, occurs in all areas, probably hybridizing.	6320-7600 ft. Roadsides, meadows.	A
07	Meagher	**Jumping Creek Campground.** Jumping Creek Campground & access road, about 17.5 miles south of Neihart off U.S. Hwy 89.	2004: Approx. 120 plants. 1992: Approx. 75 plants, estimate 75% are *C. longistylum*.	5850-6240 ft. Meadows, roadsides, open forest.	C
08	Cascade	**Neihart.** Just north of Neihart, along FS Road #834 that extends west up Harley Creek and north to upland meadows.	2004: Approx 25 *C.longistylum* plants among 600-800 plants of *C. hookerianum*. 1992: About 1,000 Cirsium plants only 1% are *C. longistylum*. 1990: Frequent in moist streamside habitats and moist meadows of upland areas.	5440-7040 ft. Roadsides, meadows, riparian areas.	D
09	Cascade, Judith Basin	**Long Baldy.** Long Baldy, Little Belt Mountains.	Historical record from 1896.	---	H
10	Meagher, Cascade	**O'Brien Creek.** Little Belt Mountains, west of Kings Hill along FS Road #839 from O'Brien Park to Lone Tree Park.	2004: Estimate 50-100 *C. longistylum* plants mixed in with several thousand *C. hookerianum* and hybrids. 1992: over 3,000 *C. hookerianum* in Moose Park, *C. longistylum* found only along roads.	7200-7300 ft. Meadows, open forest, roadsides.	C
12	Judith Basin	**Hay Coulee.** Little Belt Mountains, south of Sage Creek up Hay Coulee, about 15 miles west of Utica.	2004: Estimate 220 *C. longistylum* plants within a larger population of *C. hookerianum* and hybrids. 1992: Frequent.	5440-6180 ft. Meadow.	B
13	Cascade	**Belt Creek:** Little Belt Mountains, Belt Creek, along U.S. Hwy 89, 1 mile south of Jefferson Creek, about 4 miles southeast of Neihart.	2004: Approx. 200 *Cirsium* plants observed, about 75 *C. longistylum* and the rest *C. hookerianum* and hybrids. 1992: About 50 plants scattered along creek & highway for 2 miles either side of Many Pines Campground. 1986: 170 plants counted, 85 on each side of the creek; of 41 plants studied, 24 were identified as *C. longistylum* and 4 as *C. hookerianum*; 13 displayed characteristics intermediate between the two.	6080 ft. Riparian areas, roadsides.	C
14	Cascade	**Paine Gulch.** Little Belt Mountains, Paine Gulch, approximately 1.5 - 2.2 miles upstream from confluence with Belt Creek.	1987: 11-50 plants observed.	5200-5400 ft. Disturbed meadow.	U
15	Cascade	**Servoss Mountain.** Little Belt Mountains, southeast side of Servoss Mountain, north of divide between Ruby Creek and Henn Gulch.	A single observation from 1987.	6400 ft. Motorized trail.	U
16	Meagher	**Bair Ranch.** From Lake Sutherlin; about 7 miles NE of White Sulphur Springs to Bair Reservoir mainly on the Bair Ranch.	2004: Survey of Bair Ranch and Lake Sutherlin area estimated 600 *C. longistylum* with numerous hybrids, *C. hookerianum*, and *C. scariosum*. First observation in1986.	5500-5700 ft. Meadow.	BC
17	Judith Basin	**Upper Bear Gulch.** Little Belt Mountains, upper Bear Gulch, about 20 miles west of Utica.	2004: Approx. 300 *C. longistylum* plants mixed in with another 300 *C. hookerianum* and hybrids. 1990: About 100 plants.	6200-6530 ft. Meadow, riparian area.	C

EO #	County	Survey Site	Survey Data	Description	Ranking
18	Judith Basin	**Skunk Gulch.** Little belt Mountains, Skunk Gulch, about 12 miles northeast of Sapphire Village.	2004: Approx. 1000 *C. longistylum* plants in a larger population containing *C. hookerianum* and hybrids. 1990: Several hundred plants in flower.	6280-6530 ft. Meadow, riparian area.	B
19	Meagher	**Thornquist Gulch.** Little Belt Mountains. From White Sulphur Springs take U.S. Highway 89 north about 15 miles, then FS Road #831 north about 0.5 mile. Population extends 0.5-1.0 mile along Thornquist Gulch and along Miller Gulch.	2004: Approx. 180 *C. longistylum* plants found in a mix of hybrids and *C. hookerianum*. 1992: About 50 plants. 1990: About 50 plants.	5680-5840 ft. Roadsides, riparian areas, open forest.	C
20	Judith Basin	**Russian Flat.** Little Belt Mountains, Russian Creek, about 18 miles west of Sapphire Village and along the South Fork Judith River.	2004: Approx 2000 plants. 1992: About 600 individuals, approx. 80% *C. longistylum*. 1990: Thousands of plants plus scattered individuals extending to the east and west about 1 mile.	6350-6640 ft. Meadow.	A
21	Meagher	**Pasture Gulch.** Take U.S. Highway 12 about 5 miles east of Checkerboard, then go south on FS Road #694 about 4 miles into Pasture Gulch.	2004: Approx. 180 plants. 1992: 50 plants. 1991: 50-100 plants scattered along road and in recently logged areas.	5300-5640 ft. Roadsides, partially logged slopes.	D
22	Broadwater	**Carl Creek.** Big Belt Mountains, along Carl Creek trail, just south of trailhead off Highway 12.	2004: 12 plants. 1992: 7 plants total.	5440-5480 ft. Riparian areas, roadsides.	CD
23	Meagher	**Atlanta Creek.** Big Belt Mountains. Atlanta Ridge above Atlanta Creek, west of Atlanta Road #575, upper end of ridge and along Atlanta Creek.	2004: Estimate of 1000 plants with hybrids and *C. hookerianum* also present. 1992: Estimate of 250+ plants in peak flower, the majority at west end of meadow.	6400-7440 ft. Meadows, open forest, riparian areas.	A
24	Broadwater	**Cement Gulch.** Big Belt Mountains; take County Road 287 up Confederate and Cement gulches to near Ready Cash Gulch.	2001: 25 to 50 plants.	5600-6100 ft. Riparian areas.	C
25	Lewis & Clark	**Hogback Mountain.** Big Belt Mountains; fellfield on top of Hogback Mountain.	Observation from 1992.	7580-7800 ft. Fellfield.	U
27	Broadwater	**Confederate Gulch.** Big Belt Mountains, along Confederate Gulch just above Cement Gulch.	2004: Estimate of 35 plants. 2001: No plants located. First observation in 1992.	5220-5300 ft. Disturbed area.	C
28	Broadwater	**Boulder Creek.** Big Belt Mountains, ridgeline above Boulder Creek, accessible from FS Road #4171 to logging road to FS Trail #142, which cuts over the ridge.	1992: 20-40 plants widely scattered across exposed slope.	6920-7020 ft. Meadow.	CD
29	Broadwater	**Springs Gulch.** Big Belt Mountains, head of Springs Gulch on south slopes of Bilk Mountain, 0.3 air mile southwest of the eastern peak of Bilk Mountain; end of Springs Gulch Road (FR 1020).	2004: 30 *C. longistylum* plants in a mixed population with *C. hookerianum* and hybrids. 1992: About 50 plants; 10% *C. longistylum*, 20% *C. hookerianum* and the rest hybrids.	6640-6840 ft. Meadow, roadsides.	CD
30	Broadwater	**Long Gulch/Priest Gulch Ridge.** Big Belt Mountains, 2.7 air miles east of east summit of Bilk Mountain, ridge at the head of Long and Priest gulches; and White Gulch north of Whites City.	2004: About 85 plants in a larger population containing *C. hookerianum* and hybrids. Very weedy. 2001: Estimated 500 plants, unknown how many are *C. longistylum*. Survey extended the known occurrence approx. 2 miles along road toward Needham Mountain. 1992: About 500 individuals observed not all *C. longistylum*.	5100-7010 ft. Meadow.	B?
31	Meagher	**Brooks Creek.** From junction with U.S. Highway 12 at Checkerboard, follow FS Road 581 up Brooks Creek about 3 miles. Take left fork about 0.3 mile to site.	2004: About 50 plants, very weedy. First observed in 1992.	5960-6410 ft. Meadow, open forest.	CD

Table 1. Continued.

EO #	County	Survey Site	Survey Data	Description	Ranking
32	Meagher	**West Fork Flagstaff Creek.** From junction with U.S. Highway 12 about 3 miles southeast of Checkerboard, follow FS Road 1043 about 3.5 miles to site.	2004: Approx. 250 plants. First observation in 1992.	5400-5640 ft. Meadow, riparian areas, roadsides, sagebrush.	BC
33	Meagher	**Brooks Creek.** From junction with U.S. Highway 12 at Checkerboard, follow FS Road 581 up Brooks Creek about 2 miles. Site is along road just inside Forest Service boundary.	2004: No plants found. First observation in 1992.	5680-5770 ft. No habitat info available.	F
34	Meagher	**West Fork Checkerboard Creek.** From Checkerboard, follow FS Road 581 up Brooks Creek about 5 miles. Site is along the south side of the road beside an unnamed tributary.	Only observation in 1992.	6350-6440 ft. No habitat info available.	U
35	Meagher	**West Fork Checkerboard Creek.** Go about 4 miles southeast of Richardson Creek Campground on FS Road 211. Site runs along West Fork Checkerboard Creek to the southwest and northeast and on Hall Creek drainage.	2004: Approx. 650 plants. First observation in 1992.	6250-6530 ft. Riparian areas.	B
36	Meagher	**East Fork Checkerboard Creek.** Follow FS Road 211 about 6 miles southeast from Richardson Creek Campground. Site is along the East Fork Checkerboard Creek to the north of the road; also along FS roads 585 and 581.	2004: Estimate of 1,200 plants. First observation in 1992.	6800-6960 ft. Meadows, riparian areas, roadsides, sagebrush.	AB
37	Meagher	**West Fork Checkerboard Creek.** About 7 miles south of White Sulphur Springs, take road to east up Cottonwood Creek. Follow road to end almost to national forest boundary. Follow creek north and take east fork; site begins at fork and extends about 0.5 mile upstream.	1992: 3 subpopulations documented but no population data.	6280-6600 ft. Meadow.	U
38	Meagher	**Newlan Creek.** Take FS Road 830 off U.S. Highway 89 just south of Newlan Creek guard station. Follow the road about 4 miles up Newlan Creek. Site is to the north of road along unnamed tributary; and along FS Road 830A.	2004: Approx. 400 individuals in a larger population with *C. hookerianum* and hybrids. First observation in 1992.	5800-6400 ft. Meadows, riparian areas.	B
39	Meagher	**Sheep Cree**k. Follow U.S. Hwy 89 northeast from Forest Green about 2 miles. Take road to right to quarry about 0.25 mile. Site is along unnamed tributary of Sheep Creek.	2004: Approx. 125 plants in a larger population with *C. hookerianum* and hybrids. First observation in 1992.	6200-6440 ft. Roadsides.	BC
41	Judith Basin	**Oka Butte.** Take county road that passes rodeo grounds north of Judith Gap. Make left turn at county line, go north about 1.5 miles, then turn west for about 1.7 miles to dirt road. Go about 1 mile, turn right. Go about 2 miles to site on either side of road.	A single observation from 1988.	5640-5760 ft. Roadsides.	U
42	Wheatland	**Bartleson Peak.** Headwaters of Hopley Creek, north side of Bartleson Peak; about 20 air miles northwest of Harlowton. Approach possibly via FS Road 8823.	A single observation from 1992.	6500-7500 ft. Open forest.	U

Table 1. Continued.

EO #	County	Survey Site	Survey Data	Description	Ranking
45	Meagher	**Grouse Ridge.** Big Belt Mountains, Trout Creek Road to Dry Gulch Road, east on Beaver Creek Road (FS 138) through Indian Flats then east on FS Road 4118.	2001: More than 50 mature plants with many rosettes over 2 acres.	6610 ft. Meadow.	C
47	Lewis & Clark	**Indian Flats.** Big Belt Mountains. Trout Creek Road to Dry Gulch Road, east on Beaver Creek Road (FS 138) to Indian Flats, Pike Creek and Jim Ball Basin.	2004: 1 *C. longistylum* with 12 hybrids and 9 *C. hookerianum* in Jim Ball Basin. 34 rosettes present. 2001: <50 plants with rosettes, covering a two-mile linear strip of roadside, Identification uncertain.	6220-6530 ft. Roadsides.	C
49	Broadwater	**Grouse Creek.** Big Belt Mountains, Magpie Gulch Road to FS Road 425 G1.	2001: <10 plants, very weedy.	6264 ft. Roadsides.	D
50	Broadwater	**Nary Time Gulch.** Big Belt Mountains, Avalanche Gulch Road to Nary Time Gulch.	2001: >40 plants, weedy, disturbed site.	5120-5200 ft. Roadsides, riparian areas	C
52	Meagher	**Ohio Gulch-Benton Gulch.** Big Belt Mountains, Confederate Gulch, to Cement Gulch, to Benton Gulch and some points up Ohio Gulch.	2001: >75 plants.	5140-5560 ft. Weedy riparian area.	C
53	Broadwater	**Hellgate Canyon.** Big Belt Mountains, Hellgate Gulch Road, about 2.5 miles beyond the first creek crossing.	2001: 2 plants in area that burned in 2000.	5165 ft. Weedy riparian area.	D
54	Meagher	**Elk Ridge.** Approximately 26.5 air miles northeast of Helena airport. Take York Road; at York go to Nelson, then northeast on Road 138. Turn east at road to Jim Ball Basin. Follow road to Elk Ridge (Block Management Unit).	2002: >300 plants in 2 subpopulations.	6690-6990 ft. Meadow.	BC
56	Meagher	**Dry Range.** Approximately 20 miles northwest of White Sulphur Springs on Forest Service & private lands..	2004: Approx. 2200 *C. longistylum* plants with numerous hybrids and a few *C. hookerianum.* 2003: Estimated 10,000 plants.	4920-6200 ft. Meadows, open forest.	A
57	Judith Basin	**Hay Canyon.** Little Belt Mountains. Hay Canyon Road 6390. Site occurs from 0.8 mile to 2 miles up the canyon.	2004: 200 plants. Counted 47 flowering plants of *C. longistylum* and putative hybrids that lean towards *C. longistylum*. Many rosettes also in the area. Population is in small meadows and openings along road.	5410-5610 ft. Meadows, roadsides.	BC
58	Judith Basin	**Dry Pole Canyon.** Little Belt Mountains. Dry Pole Canyon Road 6392 from bottom of drainage to end of road.	2004: 100-150 plants. Counted 23 flowering *C. longistylum* and putative hybrids that lean towards *C. longistylum*. Numerous rosettes also encountered.	5400-6400 ft. Meadows.	BC
59	Wheatland	**Sawmill Canyon.** Little Belt Mountains. Along Forest Road 584, Sawmill Canyon.	2004: 8 plants counted. Scattered flowering plants and rosettes throughout the drainage. 2 putative hybrids also observed.	5410-5610 ft. Riparian areas, disturbed meadows, open forest.	CD
63	Cascade, Judith Basin	**Jefferson Creek-Slide Rock.** Little Belt Mountains. Approximately 3 miles SE of Neihart along Jefferson Creek Road 267 and continuing up drainage to Road 3328 and along Road 251.	2004: Estimate of 200 plants. Mixed population of *C. hookerianum, C. longistylum* and putative hybrids. Predominantly *C. hookerianum* in lower portion of drainage with more *C. longistylum* and hybrids higher in the drainage. Total thistle population in the area is approx. 1200 plants.	6000-7970 ft. Roadsides, riparian areas, meadows.	C
64	Fergus	**Big Snowy Mountains.** About 20 miles south of Lewistown.	Specimen collected in 1960.	---	H

Table 1. Continued.

EO #	County	Survey Site	Survey Data	Description	Ranking
65	Meagher	**Coates Pond.** Castle Mountains. From White Sulphur Springs take Highway 12 east to Checkerboard; travel southwest on FS Road 581 about 5 miles to FS Road 1043. Site begins about 2 miles southeast.	2004: Estimate 350 plants; very weedy.	6270-6290 ft. Weedy riparian area, meadow, sagebrush.	BC
66	Meagher	**Fourmile Creek.** From White Sulphur Springs travel east on Highway 12, turn south of FS Road 211. Population is scattered along road adjacent to Fourmile Creek to Richardson Creek Campground.	2004: Counted 114 plants.	5710-5990 ft. Roadsides, meadow, riparian area.	C
67	Meagher	**Wagner Gulch.** Big Belt Mountains. From White Sulphur Springs travel northwest on Road 360 to Wagner Gulch Road 259. Travel west on Wagner Gulch.	2004: Approx. 100 plants in a larger population of *C. hookerianum* and hybrids.	6380-6580 ft. Meadows, roadsides, open forest.	CD
68	Judith Basin, Meagher	**Elephant Rock.** Little Belt Mountains. From White Sulphur Springs travel north on FS Road 274 about 9 miles. Population is along Whitetail Creek.	2004: Estimate of 800-1000 plants, *C. hookerianum* and hybrids also present.	6000-6690 ft. Roadsides, meadows, riparian areas.	AB
69	Wheatland	**Jellison Place.** Little Belt Mountains. West of Harlowtown take the county road off Highway 89 for approximately 24 miles to FS land. Population is along roadway.	2004: Approx. 125 plants.	5800 ft. Roadsides, meadow.	C
70	Meagher	**Spring Creek.** Little Belt Mountains. Travel north on FS Road 274 about 6 miles to FS Road 6393. Travel northeast 3.9 miles to Basin Creek.	2004: About 200 plants.	5600 ft. Riparian area, grassland, sagebrush.	C
72	Meagher	**South Fork Tenderfoot Creek.** Little Belt Mountains. Site is above junction of Road 6424 and Road 586 to just before the crest where road drops into the South Fork Tenderfoot.	2004: Estimate of 30-40 plants, 6 of them flowering. *C. hookerianum* and hybrids also present. Many rosettes present.	6000-6400 ft. Roadsides, riparian areas.	D

E. Habitats

C. longistylum occurs in a variety of open habitats that receive full to partial sun. The best habitats for the species occur in montane to subalpine meadows. Occurrences are also common along roadsides, herbaceous-dominated riparian areas and open forests of Douglas-fir, lodgepole pine or whitebark pine. Plants occur as low 4800 feet elevation up to approximately 8100 feet with the majority of the occurrences between approximately 6000 and 7500 feet.

Periodic disturbance appears to play a key role in the survival and establishment of populations. Establishment of seedlings in meadow populations appears to be highest in areas following disturbance by rodents churning the soil. Fire also appears to be beneficial to the species with high numbers of flowering plants and rosettes seen in the Spur Park and Ant Park areas following fire. Anthropogenic disturbance also appears to be beneficial under some circumstances. Roadsides provide habitat for the species throughout its range due to the bare soil, lack of competition and the increased availability of light, water and nutrients that are common along many mountain roads. These populations are also susceptible to the negative impacts associated with roads such as weed invasion, herbicide spraying and road grading, among other possible threats.

Species composition at local *C. longistylum* sites varies widely across its range and even within an individual population. Elevation and the type of habitat (meadow, open forest, riparian or roadside) occupied are significant factors in determining

species composition. Below is a list of some of the more common species encountered, organized by lifeform.

Trees
Pseudotsuga menziesii (Douglas-fir)
Pinus contorta (lodgepole pine)
Pinus albicaulis (whitebark pine)

Shrubs
Artemisia tridentata ssp. *vaseyana* (mountain big sage)
Juniperus communis (common juniper)
Juniperus horizontalis (horizontal juniper)
Potentilla fruticosa (shrubby cinquefoil)

Grasses
**Bromus inermis* (smooth brome)
Festuca idahoensis (Idaho fescue)
Festuca scabrella (rough fescue)
Koeleria macrantha (prairie junegrass)
**Phleum pratense* (common timothy)
**Poa pratensis* (Kentucky bluegrass)
Stipa richardsonii (Richardson's needlegrass)

Forbs
Achillea millefolium (common yarrow)
Agoseris glauca (false mountain dandelion)
Anemone multifida (cliff anemone)
Antennaria microphylla (rosy pussy-toes)
Arenaria congesta (ballhead sandwort)
Campanula rotundifolia (harebell)
Cerastium arvense (field chickweed)
Galium boreale (northern bedstraw)
Geranium richardsonii (white geranium)
Geranium viscosissimum (sticky geranium)
Geum triflorum (prairie smoke)
Lupinus argenteus (silvery lupine)
Potentilla gracilis (slender cinquefoil)
Solidago multiradiata (mountain goldenrod)
**Taraxacum officinale* (common dandelion)
**Thlaspi arvense* (field pennycress)

*non-native species


Figure 5. *Cirsium longistylum* habitat in the Dry Range.


Figure 6. *Cirsium longistylum* habitat and flowering plants near Spur Park after fire.

Known occurrences of *C longistylum* are predominantly on calcareous soils derived from dolomites, limestones or shales. Though intrusions of coarse-grained metamorphics are common in the Belts and the Castle Mountains, soils derived from these parent materials typically do not harbor populations of long-styled thistle. Unfortunately, good site-specific soil data are not available for most of the known populations.

F. Land Ownership

Most occurrences are on National Forest lands managed by the Helena and Lewis and Clark National Forests. Ten populations occur partially or entirely on private lands with the occurrences in the

Dry Range and on the Bair Ranch containing two of the larger populations. The Bair Ranch population is also the only one that extends onto state trust lands adjacent to Lake Sutherlin.

G. Potential Threats to Known Populations

1. Introduced Bio-controls: *Rhinocyllus conicus*, an inflorescence-feeding weevil was introduced into the United States in 1969 for control of *Carduus* species, including *Carduus nutans* (musk thistle). Pre- and early post-release studies of the weevil on native *Cirsium* species demonstrated that the weevil showed a strong preference for *Carduus* species over *Cirsium* species in terms of oviposition, feeding and larval growth. Thus an impact on native *Cirsium* species was not expected (Louda and Arnett 2000, Louda 1998). However, *Rhinocyllus conicus* is now prevalent on *Cirsium longistylum* and many other native thistles including *Cirsium undulatum, C. hookerianum, C. centaureae, C. scopulorum* and *C. canescens* in the Rocky Mountain West (Louda and Arnett 2000). Studies by Louda and others (1997) show reductions in viable seed up to 86% in *C. canescens* and an average reduction of 72% in *Cirsium undulatum* in Colorado and South Dakota. Seed reduction in *C. longistylum* during 1991 and 1992 was estimated at 61% and 46% respectively at one site in the Little Belt Mountains (Heidel 1994). Infestation rates are typically highest on the terminal or oldest flower heads while later developing flower heads and seeds may escape predation. Monitoring of infestation rates by the U.S. Forest Service at the Kings Hill site in the Little Belt Mountains produced the following percentages for 1991-1993 respectively: 80%, 72% and 0% of flowers infested. The elimination of the weevil at the site in 1993 is believed to be the result of a late August snow in 1992 that ended the growing season early and prevented the weevil from completing its life cycle (Heidel 1994).

Surveys of *C. longistylum* populations in 2004 did not systematically document infestation rates, though random sampling of mature flower heads found the majority of heads infested with weevil

Figure 7. *Rhinocyllus conicus* weevils on *C. longistylum* in the Little Belt Mountains.

larvae. It was also noted that later maturing flowering heads were typically uninfested due to inappropriate timing of their development with the life stages of the weevil. This incomplete synchrony of the thistles' and weevils' life cycles has also been documented by Herr (2000) in *C. occidentale* and by Louda (1998) in *C. pitcheri*, a federally threatened species. Additionally, the results of Herr's seed bank and seed addition experiments on *C. occidentale*, in conjunction with an average seed destruction rate of 21% across all flower heads, indicate that a significant reduction in seedling establishment is not expected.

Though the weevil appears to have a significant impact on the total number of viable seeds produced it is unclear whether this will lead to a long-term decline of long-styled thistle populations since a percentage of seeds, particularly from late maturing heads, escape predation. Field observations from 1990-2004 have documented good establishment of rosettes at many sites even though weevils have been present in the populations, providing some evidence that enough seeds escape predation to maintain populations.

2. Hybridization: Hybridization and introgression of *C. longistylum* with other *Cirsium* species, particularly *C. hookerianum* is another potentially threat to the long-term viability of *C. longistylum*. Many populations possess individuals with involucral bract characteristics that are intermediate between the two species (Schassberger 1991,

Poole and Heidel 1993). These intermediate bract characteristics have been noted in populations where only a few plants of *C. hookerianum* are present. This leads to the possibility that only a few flowering individuals of *C. hookerianum* may be enough to contaminate the gene pool of *C. longistylum*. However, Brunsfeld and Baldwin's (1995) genetic analysis provided evidence that *C. longistylum* is genetically distinct from its closest relatives in west-central Montana and that putative hybrids are genetically similar to "pure" *C. longistylum*. Their study also showed that *C. longistylum* possesses more variability than the other species sampled but it is unclear whether this is due to hybridization with the other thistles. Until wider-ranging and more in-depth genetic studies of *C. longistylum* and related species are completed it is unclear what, if any, affect gene flow among *Cirsium* species in central Montana may be having on *C. longistylum*.

3. Recreation: Off-road vehicle use has historically occurred in areas occupied by the thistle and was noted in limited areas during recent field surveys. However, this activity is not believed to have a significant direct impact on the species' potential for long-term survival as long as use does not significantly increase. Indirectly, off-road vehicles and traffic on designated routes may impact populations through the spread of weed seeds and the subsequent establishment of new weed infestations into *C. longistylum* habitat.

4. Weed Invasion and Herbicides: As noted above, weed invasion of *C. longistylum* habitat and populations is an increasing threat to the short-term survival of populations and the long-term survival of the species. Several non-native plant species are of particular concern, including *Cirsium arvense* (Canada thistle), *Bromus inermis* (smooth brome) and *Phleum pratense* (common timothy). The first species is a state of Montana designated noxious weed and, as such, landowners are required to eradicate or control populations on their land. Canada thistle is a perennial that reproduces from wind dispersed seeds and rhizomes and is capable of rapid expansion and long-distance dispersal. The habitat requirements of Canada thistle overlap with that of long-styled thistle and include montane meadows, riparian areas and roadsides. At present, populations of Canada thistle occur throughout the range of long-styled thistle, though it currently is not having a significant adverse impact.

Bromus inermis and *Phleum pratense* have long been used as pasture grasses and for revegetation projects following fires and other natural and human-caused disturbances. Both species inhabit montane to subalpine meadows and roadsides where they may form dense stands that preclude the germination and establishment of *C. longistylum*. *Bromus inermis* is of particular concern in that it is a deep-rooted sod-forming grass that appears to exclude other species and is already prevalent in many lower quality *C. longistylum* populations. As this species is not a listed noxious weed in the state it is generally not controlled and in fact it is still seeded for forage and revegetation projects. As such, *B. inermis* potentially poses the biggest threat to *C. longistylum* populations of all wildland weeds.

Many other non-native species have routinely been documented during surveys for long-styled thistle, including *Carduus nutans, Cirsium vulgare*, *Cynoglossum officinale*, *Poa pratensis*, *Taraxacum officinale* (common dandelion) and *Thlaspi arvense* (field pennycress). Further monitoring of *C. longistylum* populations is required to determine the impact that invasive weeds are having on individual populations and on the long-term viability of the species. Due to the network of roads that occur throughout the range and habitat of *C. longistylum*, expansion of non-native species should be expected in the future and weed control and eradication measures should be implemented as appropriate.

Herbicide spraying directly on *C. longistylum* plants has been noted during past surveys, particularly along roadsides. This detrimental activity, though limited in scope, is easily preventable by increasing awareness of the species and the distinction between native and exotic thistles.

5. Grazing: Grazing is a historical and current use in many areas occupied by long-styled thistle. Consumption of flowering stalks and rosettes by cattle has been observed (Figures 8-9) in the field, though this is usually minimal as long as more palatable vegetation is present. Livestock may have an indirect adverse impact by spreading weeds into previously uninfested areas. However, livestock grazing may reduce competition and increase bare soil, leading to an increase in germination and establishment of *C. longistylum* in some sites. Currently, light to moderate grazing is not believed to have direct significant adverse impacts on the long-term survival of the species, though short-term adverse impacts may occur in localized areas.

Figures 8-9. Grazing impacts on *Cirsium longistylum.*

III. Assessment and Recommendations

A. General Assessment of Trends and Status

As of 2004, 47 extant occurrences of *Cirsium longistylum* are known across the species' range. Of these, seven are ranked as having "excellent" or "good to excellent" long-term viability, another five have "good" viability and an additional seven have "good to fair" estimated viability. The seven highest quality populations, totaling approximately 18,000 plants, represent the majority of the documented/estimated plants in 2004. However, the majority of occurrences occupy roadsides, have low population numbers and/or inhabit degraded habitats that result in fair to poor long-term estimated viability for those populations.

Both long-term and short-term trends for the species are not readily apparent. Surveys previous to 2004 did not thoroughly document the extent of many populations and/or population estimates were vague, imprecise or even non-existent. However, data from several populations suggest that populations have remained relatively stable over two decades with large yearly fluctuations possible. Germination and establishment of new plants appears to be partially dependent on several factors, including climate patterns and periodic disturbance from fire, rodent activity, grazing or other sources that result in a favorable seedbed. Flowering of plants appears to be partially related to availability of adequate moisture and nutrients. Disturbances such as fire that increase both of these factors may lead to increased flowering the following year or two, as was seen in the Ant Park and Spur Park areas in the Little Belts. Large variations in rosette numbers and flowering plants is possible over a time period of several years, meaning that many years of population data are needed to accurately estimate trends.

Demographic monitoring plots (Figures 10-12) established in 1990 by the Montana Natural Heritage Program provide limited data on population trends at three sites. Since these plots were not established for the purpose of population monitoring, their limited number and size do not provide a good overall picture. All three sites show flowering plants in 2004 within the range of variation measured in the early 1990's. Rosettes have declined in 2004 relative to counts in the 1990's at the Kings Hill and Neihart sites. In contrast, the Russian Creek site shows a slight population increase in 2004 over past counts.

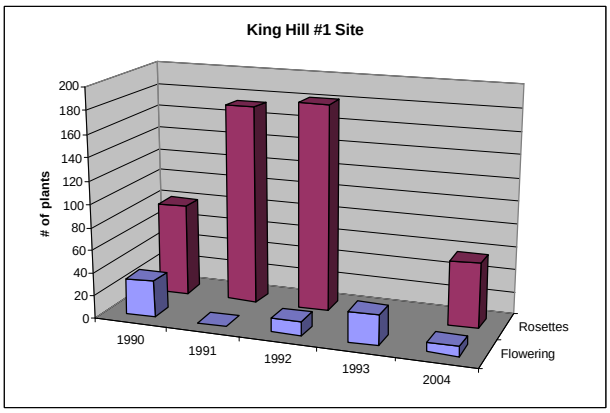


Figure 10. Permanent monitoring plot (15' radius) near Kings Hill, Little Belt Mountains. No data is available for rosettes in 1993.

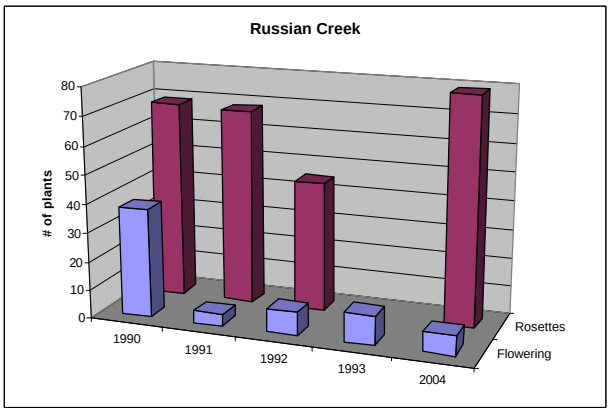


Figure 11. Permanent monitoring plot (37' radius) near Russian Creek, Little Belt Mountains. No data is available for rosettes in 1993.

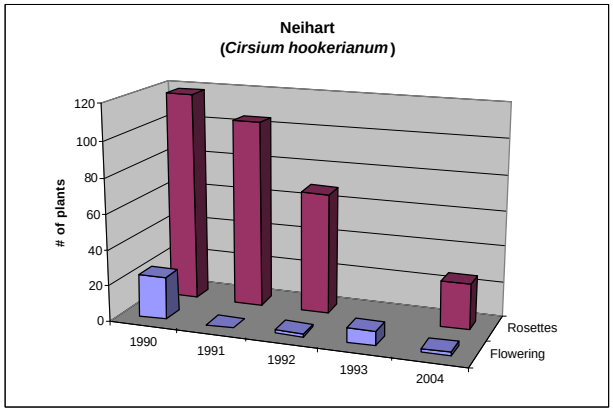


Figure 12. Permanent monitoring plot (15' radius) near Neihart, Little Belt Mountains. No data is available for rosettes in 1993. This plot is actually occupied by *C. hookerianum*, not *C. longistylum*.

A final semi-quantitative assessment was conducted using the approaches outlined by Regan, Master and Hammerson (2004) and adapted by the Montana Natural Heritage Program for use in ranking Animal Species of Concern (MTNHP 2004). Both of these similar assessment methods assign points to factors such as number of occurrences, population size, area or range extent, trends and threats. Some factors may not be used if data is missing or an estimate of the parameter is too uncertain. The points from the most pertinent criteria are added together to form a final score for the species. Lastly, a heritage rank of 1 to 5 at a global and/or state level is assigned based on the final score. The ranking criteria and scores assigned to *C. longistylum* are found in Table 2 using the two slightly different scoring methods.

Table 2. Ranking factors and assigned scores for the *C. longistylum* assessment. The first numbers in the Point Allocation column are those used in the scoring method of Regan, Master and Hammerson (2004) and the second numbers in the column are those used in the method outlined by the MTNHP State rank criteria for Animal Species of Concern. See Regan, Master and Hammerson (2004) and MTNHP (2004) for a complete discussion of the methodologies.

Factor	Parameter Estimate	Category	Point Allocation
# of Occurrences	21-80	C	3/Not used
Condition of Occurrences	Some (13-40) with good or excellent viability	D	0/Not used
Population Size	10,000-100,000 plants	F	0/0
Area of Occupancy	20-100 km2 (5,000-25,000 acres)	D	Not used/0.25
Geographic Range	1,000-5,000 km2 (400-2,000 sq. miles)	D	Not used/Not used
Long-term Trend	Relatively stable (+- 25% change)	E	0
Short-term Trend	Short-term trend unknown	U	Not used/Not used
Threats-Severity	Low to moderate	C-D	-0.38/-0.38
Threats-Scope	Moderate?		
Threats-Immediacy	Moderate to high		
Intrinsic Vulnerability	Not intrinsically vulnerable to moderately vulnerable	B-C	Not used/Not used
Environmental Specificity	Narrow specialist with key requirements common	B	Not used/Not used
		Initial Point Allocation	0/3.5
		Score	2.62/2.87
		Rank	G3-S3/G3-S3

The assignment of the threat attributes of severity, scope and immediacy is still a mostly subjective process and as such is open to interpretation and discussion. The two most apparent threats to the viability of the species appear to be from competition and loss of habitat due to weed invasion and from seed predation by the *Rhinocyllus* weevil. In terms of weed invasion, roadside sites and lower elevation populations are currently most affected by weeds. Higher elevation sites typically have very few weeds that are currently posing problems and/or are not immediately threatened by invasion of weeds that are likely to cause major problems in these colder environments. This may change if new weeds that possess the ability to rapidly reproduce and spread become established in these montane and subalpine meadows.

The introduced bio-control weevil has already invaded most, if not all, of the populations of *C. longistylum*. However, weevil population levels at the higher elevation sites are probably cyclical in central Montana due to variations in yearly weather. Cold weather and associated snowfalls early or late in the growing season appear to have a significant affect on the weevils' ability to survive and reproduce, resulting in significant declines or local eradication of the weevil for short time spans. When coupled with the lack of data on the influence that seed predation from the weevil is having on long-styled thistle populations, it becomes difficult to assign an accurate threat ranking, particularly in terms of severity.

B. Status Recommendation

Population estimates of approximately 30,000 plants, including seven high quality populations, scattered over four mountain ranges are promising for the long-term viability of the species. Habitat in the largest populations is generally of high quality with few if any problem weeds posing significant and immediate threats. In the near future, little change in habitat quality is expected in these populations. Sites are mostly on National Forest lands that provide a degree of protection and two large populations on private lands that have a history of light to moderate grazing appear stable. Also of benefit at this time is the active weed control program employed by the private landowners on their lands.

Long- and short-term population trends are difficult to gauge due to the lack of good survey data over many years. However, available data and observations provide some evidence that population levels have at least remained fairly stable over the past decade, with significant yearly fluctuations possible. Threats posed by invasive weeds and the introduced bio-control agent do provide reason for concern. Thus, population monitoring of long-styled thistle should continue in the future.

As a result of this assessment, the Montana Natural Heritage Program ranking of the species will change from the current G2/S2 to a G3/S3 (see Appendix A: Global/State Rank Definitions).

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APPENDIX A. GLOBAL/STATE RANK DEFINITIONS

HERITAGE PROGRAM RANKS

The international network of Natural Heritage Programs employs a standardized ranking system to denote global (range-wide) and state status. Species are assigned numeric ranks ranging from 1 to 5, reflecting the relative degree to which they are "at-risk". Rank definitions are given below. A number of factors are considered in assigning ranks — the number, size and distribution of known "occurrences" or populations, population trends (if known), habitat sensitivity, and threat. Factors in a species' life history that make it especially vulnerable are also considered (e.g., dependence on a specific pollinator).

GLOBAL RANK DEFINITIONS (NatureServe 2003)

G1	Critically imperiled because of extreme rarity and/or other factors making it highly vulnerable to extinction
G2	Imperiled because of rarity and/or other factors making it vulnerable to extinction
G3	Vulnerable because of rarity or restricted range and/or other factors, even though it may be abundant at some of its locations
G4	Apparently secure, though it may be quite rare in parts of its range, especially at the periphery
G5	Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery
T1-5	**Infraspecific Taxon** (trinomial) —The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank

STATE RANK DEFINITIONS

S1	At high risk because of extremely limited and potentially declining numbers, extent and/or habitat, making it highly vulnerable to extirpation in the state
S2	At risk because of very limited and potentially declining numbers, extent and/or habitat, making it vulnerable to extirpation in the state
S3	Potentially at risk because of limited and potentially declining numbers, extent and/or habitat, even though it may be abundant in some areas
S4	Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern
S5	Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range

COMBINATION RANKS

G#G# or S#S#	**Range Rank**—A numeric range rank (e.g., G2G3) used to indicate uncertainty about the exact status of a taxon

QUALIFIERS

NR	Not ranked
Q	**Questionable taxonomy that may reduce conservation priority**—Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank

X	**Presumed Extinct**—Species believed to be extinct throughout its range. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered
H	**Possibly Extinct**—Species known from only historical occurrences, but may never-the-less still be extant; further searching needed
U	**Unrankable**—Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends
HYB	**Hybrid**—Entity not ranked because it represents an interspecific hybrid and not a species
?	**Inexact Numeric Rank**—Denotes inexact numeric rank
C	**Captive or Cultivated Only**—Species at present is extant only in captivity or cultivation, or as a reintroduced population not yet established
A	**Accidental**—Species is accidental or casual in Montana, in other words, infrequent and outside usual range. Includes species (usually birds or butterflies) recorded once or only a few times at a location. A few of these species may have bred on the one or two occasions they were recorded
Z	**Zero Occurrences**—Species is present but lacking practical conservation concern in Montana because there are no definable occurrences, although the taxon is native and appears regularly in Montana
P	**Potential**—Potential that species occurs in Montana but no extant or historic occurrences are accepted
R	**Reported**—Species reported in Montana but without a basis for either accepting or rejecting the report, or the report not yet reviewed locally. Some of these are very recent discoveries for which the program has not yet received first-hand information; others are old, obscure reports
SYN	**Synonym**—Species reported as occurring in Montana, but the Montana Natural Heritage Program does not recognize the taxon; therefore the species is not assigned a rank
*	A rank has been assigned and is under review. Contact the Montana Natural Heritage Program for assigned rank
B	**Breeding**—Rank refers to the breeding population of the species in Montana
N	**Nonbreeding**—Rank refers to the non-breeding population of the species in Montana

APPENDIX B. ELEMENT OCCURRENCE RANK DEFINITIONS

ELEMENT OCCURRENCE RANK DEFINITIONS

A - Excellent estimated viability/ecological integrity
A? - Possibly excellent estimated viability/ecological integrity
AB - Excellent or good estimated viability/ecological integrity
AC - Excellent, good, or fair estimated viability/ecological integrity
B - Good estimated viability/ecological integrity
B? - Possibly good estimated viability/ecological integrity
BC - Good or fair estimated viability/ecological integrity
BD - Good, fair, or poor estimated viability/ecological integrity
C - Fair estimated viability/ecological integrity
C? - Possibly fair estimated viability/ecological integrity
CD - Fair or poor estimated viability/ecological integrity
D - Poor estimated viability/ecological integrity
D? - Possibly poor estimated viability/ecological integrity
E - Verified extant (viability/ecological integrity not assessed)
F - Failed to find
F? - Possibly failed to find
H - Historical
H? - Possibly historical
X - Extirpated
X? - Possibly extirpated
U - Unrankable
NR - Not ranked

APPENDIX C. ELEMENT OCCURRENCE MAPS FOR *CIRSIUM LONGISTYLUM*

Figure 1. Extant Occurrences of Cirsium longistylum in the northern Big Belts.

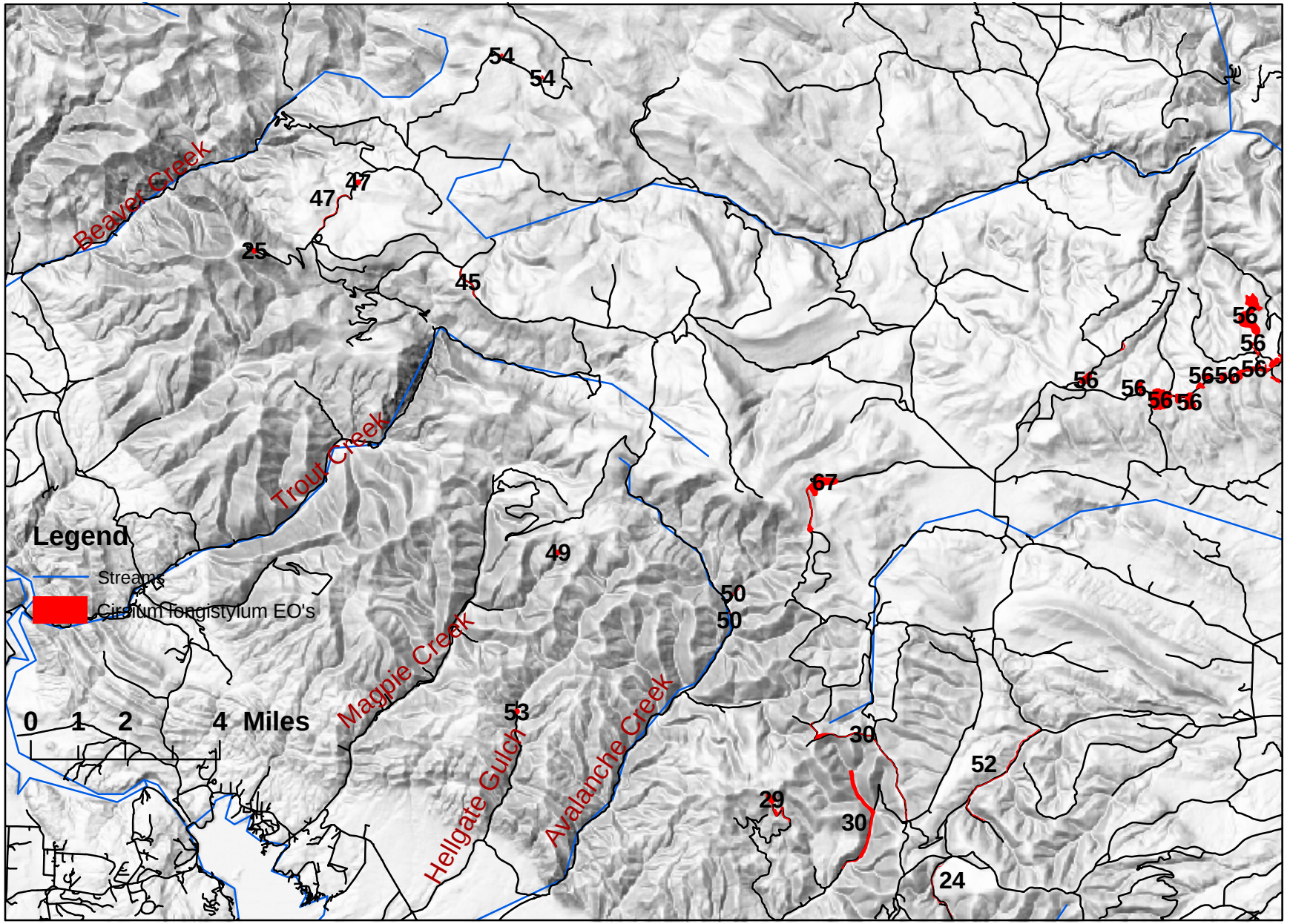

Figure 2. Extant Occurrences of Cirsium longistylum in the central and southern Big Belts and the western Castle Mountains.

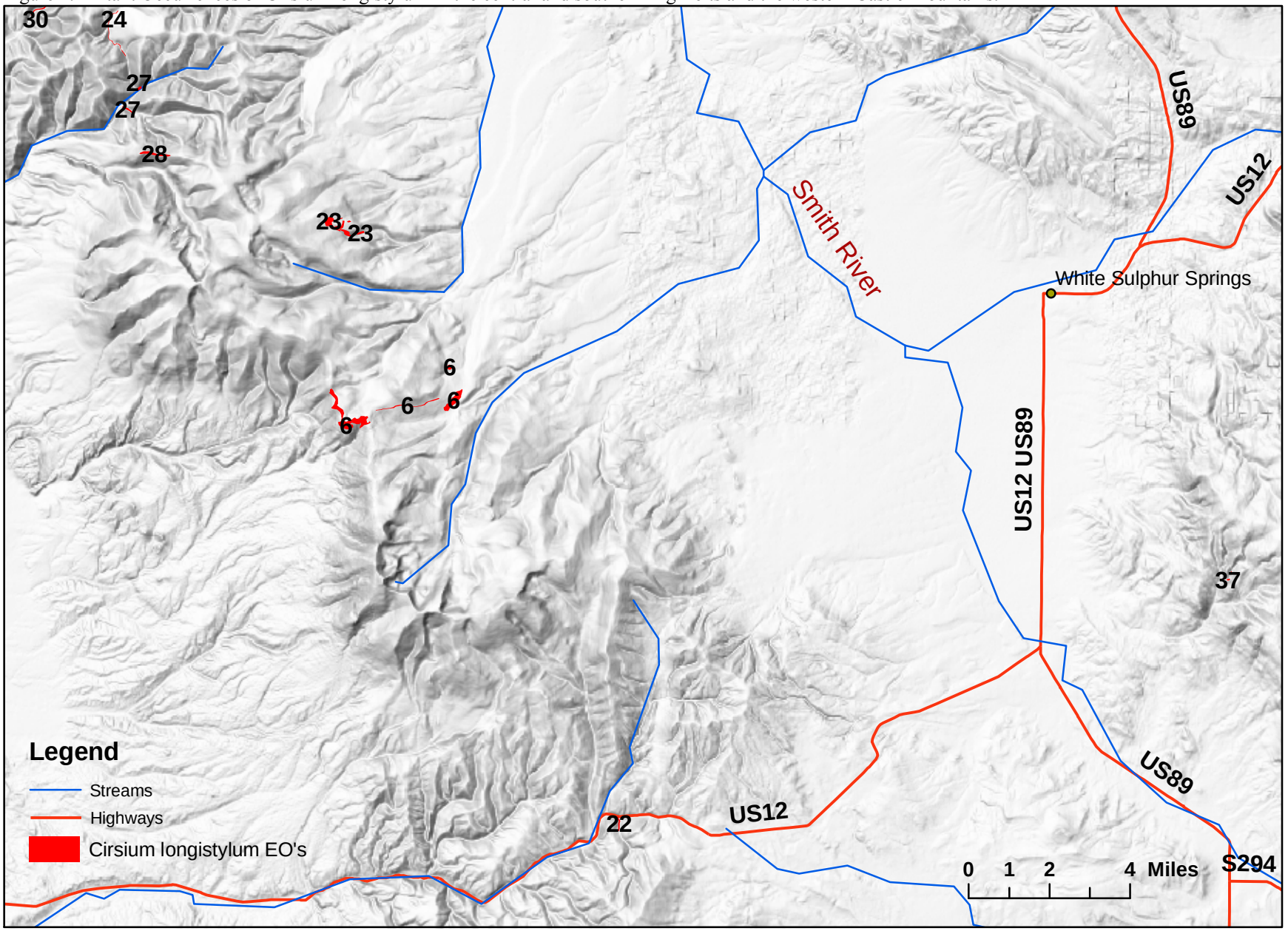

Figure 3. Extant Occurrences of Cirsium longistylum in the Dry Range and the western Little Belt Mountains.

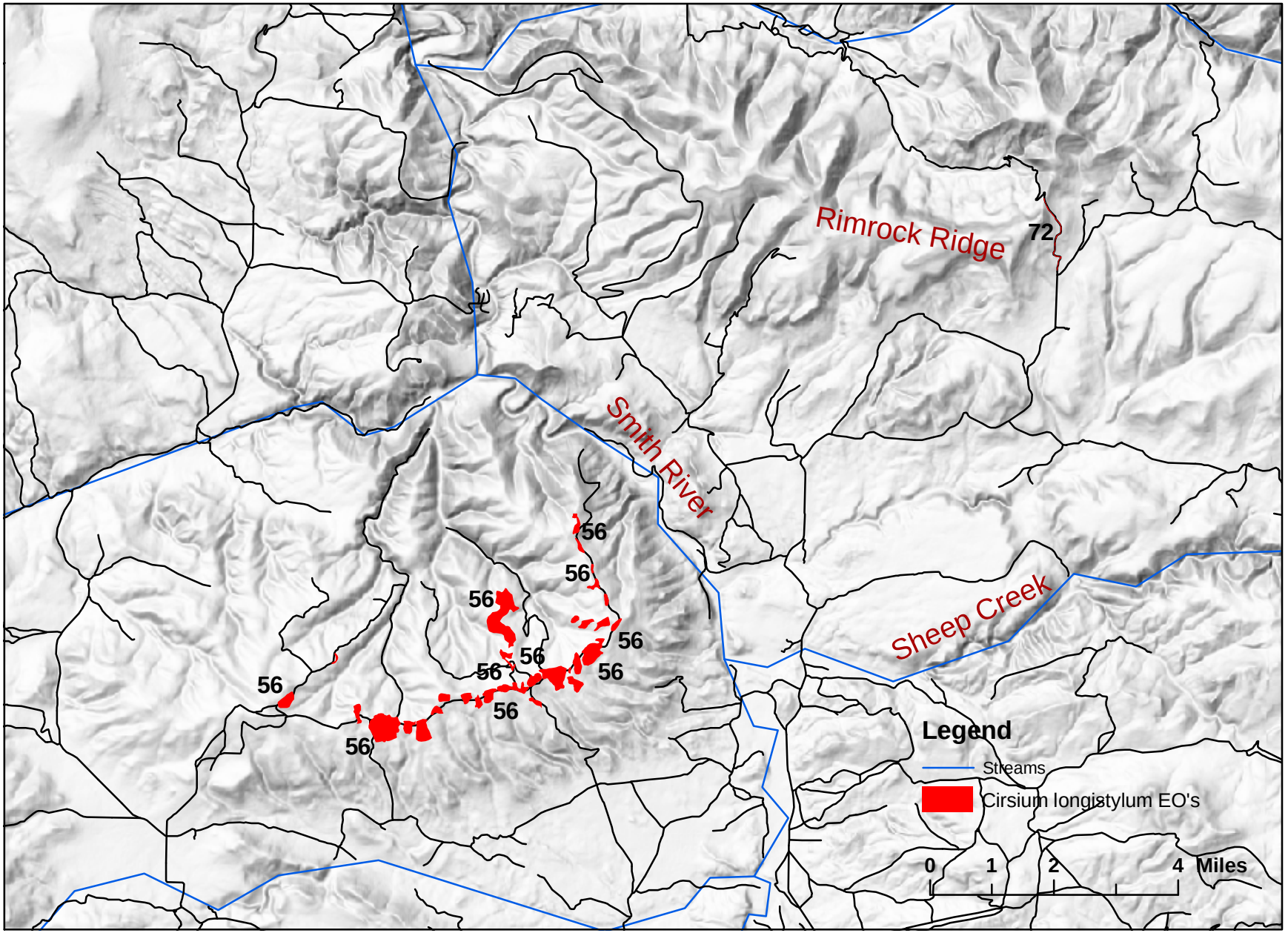

Figure 4. Extant Occurrences of Cirsium longistylum in the northern Little Belts.

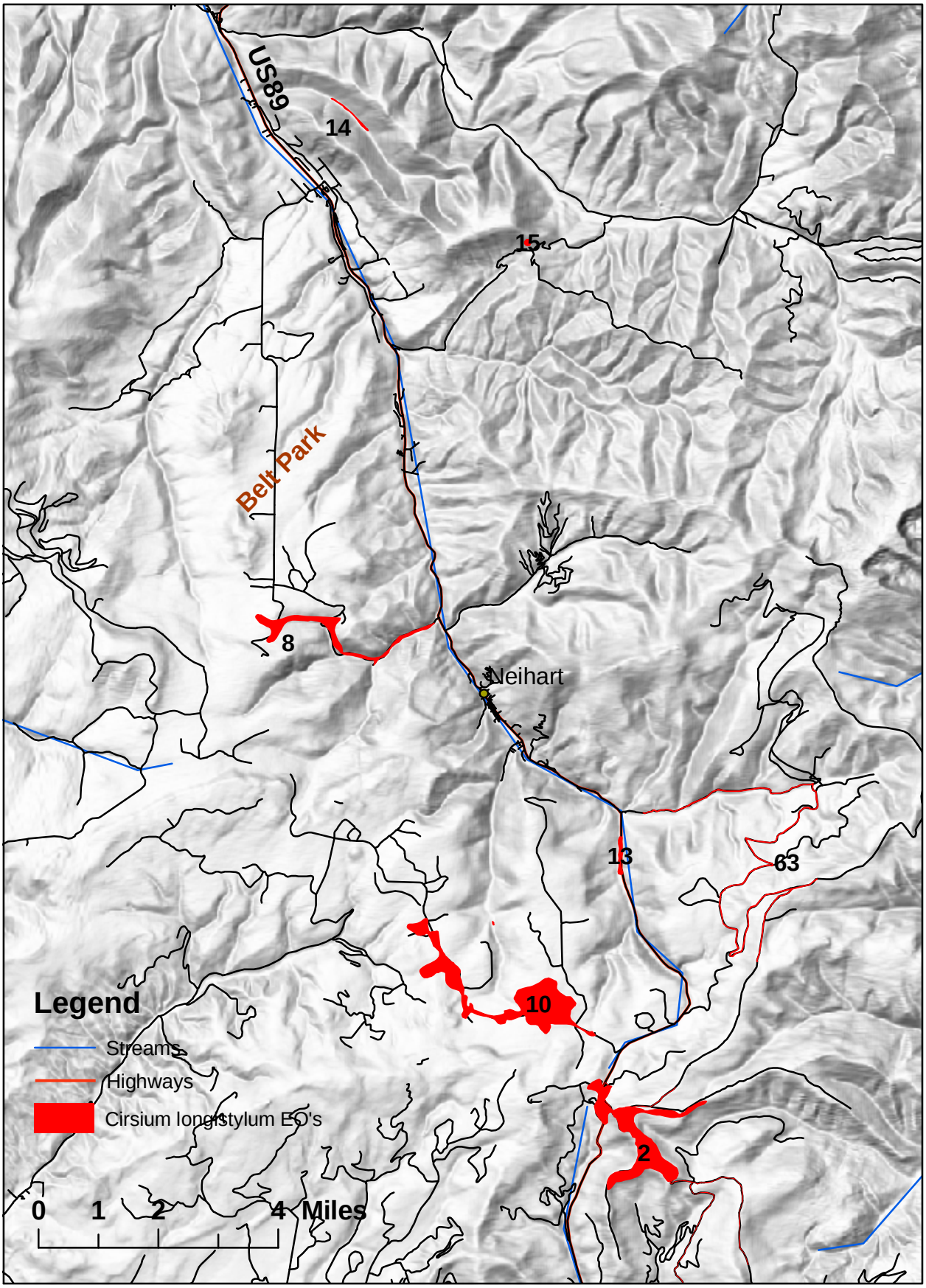

Figure 5. Extant Occurrences of Cirsium longistylum in the central and southern Little Belts.

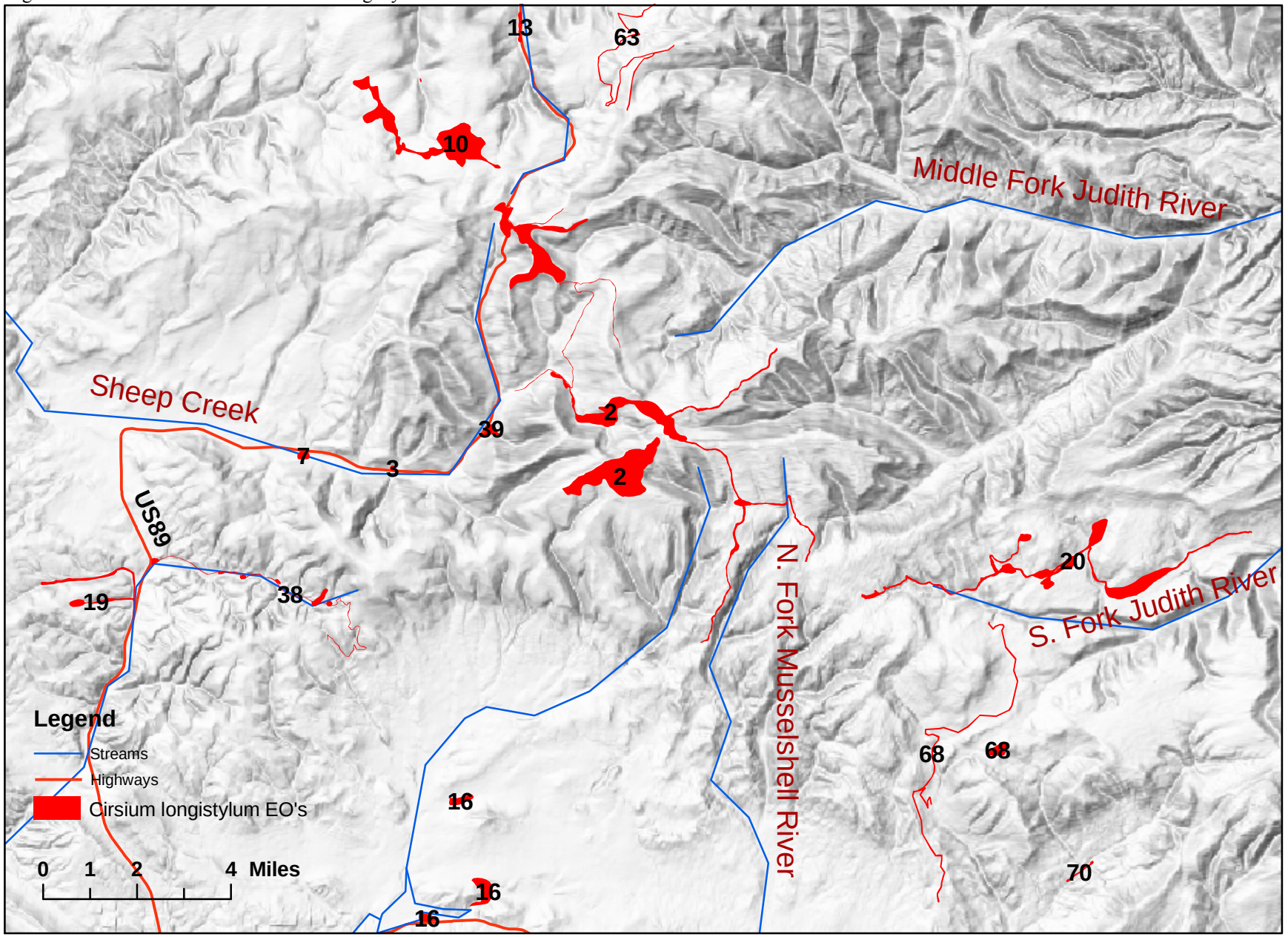

Figure 6. Extant Occurrences of Cirsium longistylum in the Castle Mountains and Bair Ranch areas.

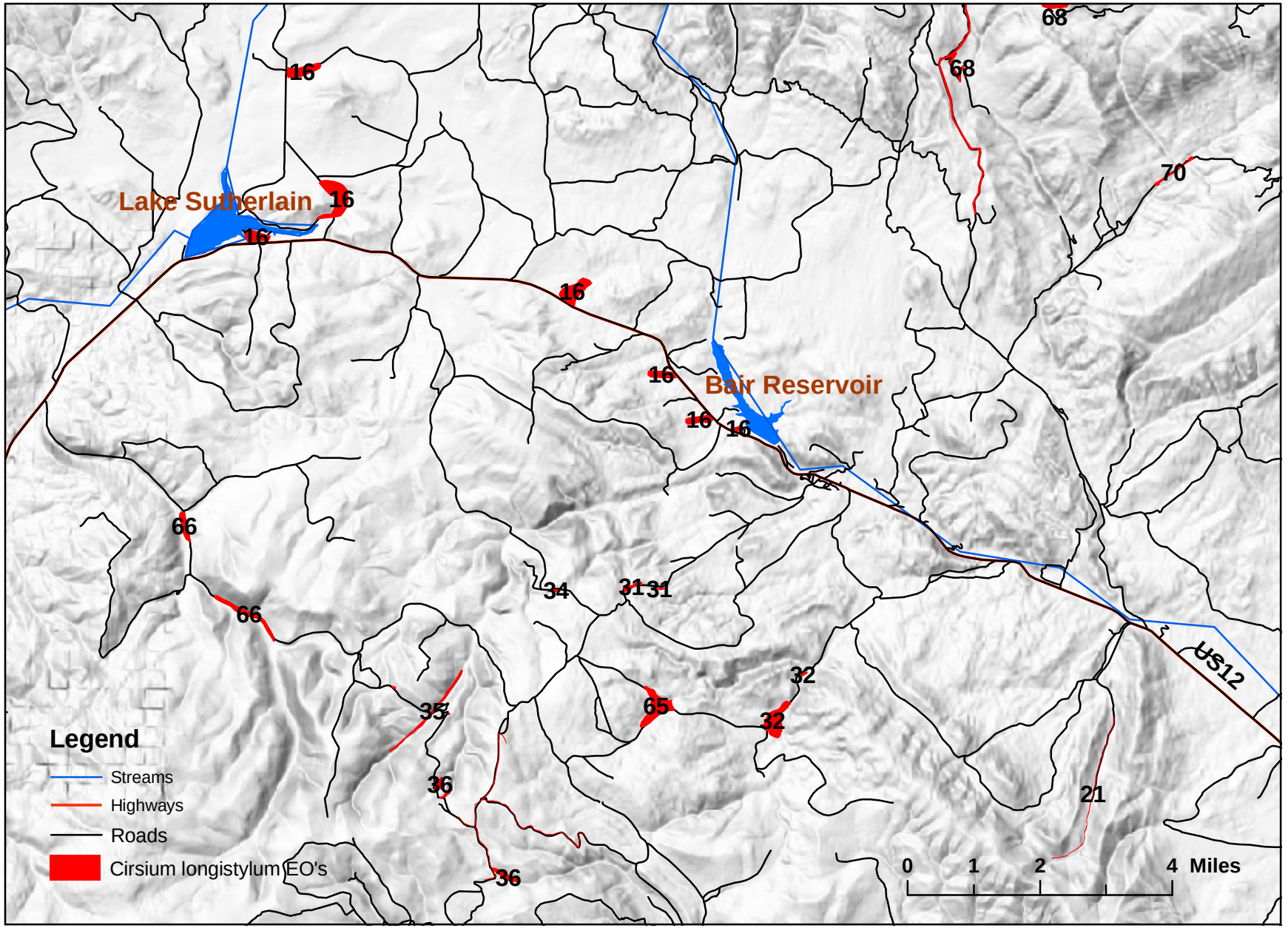

Figure 7. Extant Occurrences of Cirsium longistylum in the eastern Little Belts.